CORPORATE METROLOGY CENTER
ID No:
AP – KKPABLL

# MODEL PAB TYPE-LL

# REGULATED DC POWER SUPPLY

# OPERATION AND SERVICE MANUAL

PAB 32-3
PAB18-4.5
PAB18-5.5

CALIBRATION
COPY
MS-7 (3-88)

Kikusui
INTERNATIONAL CORP.

MODEL PAB TYPE-LL

REGULATED DC POWER SUPPLY

# OPERATION AND SERVICE MANUAL

PAB 32-3

PAB18-4.5

PAB18-5.5

~~PAB32-3~~

This manual has been written for the Agents of Kikusui Electronics Corporation.

KIKUSUI ELECTRONICS CORPORATION

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# 1. GENERAL

Kikusui PAB Series Regulated DC Power Supplies are compact, light, transistorized series regulator type, and provides larger current rates for its sizes. The output voltage is finely variable for a range of 0 to the rated voltage with a 10-turn potentiometer or a combination of coarse and fine adjustment potentiometers. A voltmeter and an ammeter are mounted on the front panel.

To guard against overload and shorting of the output circuit, PAB Series are incorporated with a constant-current-type current limiting circuit which operates positively. The limiting current value is continuously variable for a range of 10% ~ 100% of the rated current, and PAB Series can be used as a constant-current power supply.

Two units of the same model can be operated in parallel in a one-control mode (master-slave mode) of operation, thereby doubling the output current rating.

Up to two units can be installed on a 19-inch standard rack, using the frame and mounting brackets which are available as options.

**CALIBRATION PROCEDURE**
**Corporate Metrology Center**

Issued to: **Department 206 E-Team x69093**

MFR/MODEL KIKUSUI PAB 32-3, 18-4.5, 18-5.5
EQUIP DESCR Power Supply

WRITTEN BY Mike L. Moore DATE 23-SEP-1994
REVISED BY Mike L. Moore DATE 23-SEP-1994
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VERIFIED BY John A Gallini DATE 05-Oct-1994

APPROVED BY M L Moore DATE 25-Oct-1994

PC Disk File: C:\winword\proc\G-L\KKPABLL.DOC
Procedure ID:AP-KKPABLL.DOC

| EQUIPMENT REQUIRED | | |
|---|---|---|
| **MFR / MODEL NUMBER** | **DESCRIPTION** | **LOCATION** |
| **STANDARDS:** | | |
| Fluke 8506A<br>or HP 3458A | DMM (voltage checks) | Meter Area |
| FLUKE 77<br>or Ballantine 1625A | DMM 10 AMP(current check)<br>Shunt Current | "<br> |
| TEK 7600 series<br>TEK 7B53A<br>TEK 7A22 | Oscilloscope<br>TIMEBASE<br>DIFF AMP | Scope Area<br>"<br>" |
| | | |
| **ACCESSORIES:** | | |
| TEK P6063B | X1 Scope Probe (ripple) | Meter Area |
| GENRAD W20MT3A | Variac 15A min / 0-140 V | " |
| CLAROSTAT 240 (2EA)<br>OR VAR LOAD RACK | Resistive Load | CAB |
| | | |

**PREPARATION**

1) Check that all test equipment used to perform this calibration has been calibrated.
2) Clean the instrument that is to be calibrated.
3) All test equipment including the unit to be tested must be turned on & allowed sufficient warm-up time.

**INTRODUCTION**

1) It is assumed that the person performing the tests will supply whatever cables, connectors, & adapters necessary to perform the tests.

2) Although this procedure is a Partial Calibration that does not test all specifications; it does check critical parameters that should ensure proper operation and output as specified.

3) No adjustments are incorporated in this procedure. Refer to the manufacturer manual for adjustments. Troubleshooting refer to the

manufacturer manual.

1.00 **CHECK GROUND SAFETY**

Connect the Fluke 77 Test leads between Chassis Ground & the line cord ground pin of the UUT .

1.01 CHECK: < = 0.5 Ohms power cord resistance (for ground safety).

2.00 **CHECK METER ACCURACY**

2.02 Connect equipment as shown in Figure 1.

2.03 Connect Voltmeter and Load leads as shown in Figure 1A.

2.04 Connect the LOAD to the UUT output (see fig 1) and use the Ballantine 1625A Shunt to monitor current. ( use 20 AMP range)

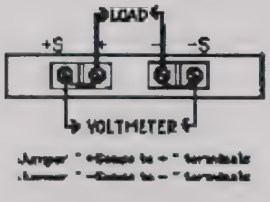



fig. 1A

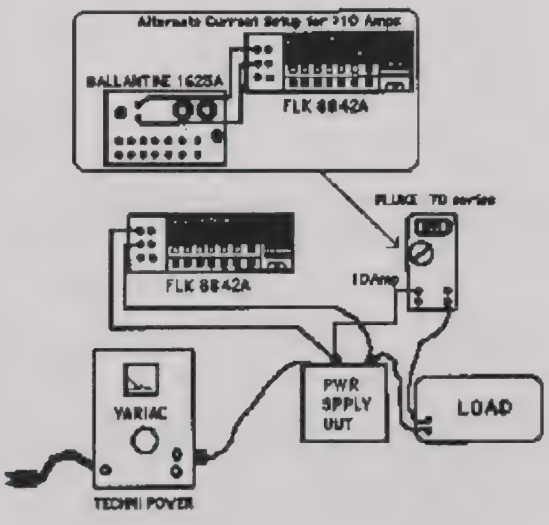



fig. 1

2.05 **VOLT METER & OUTPUT ACCURACY** (continued)

2.06 SET the:

VARIAC to 115 Volts

LOAD OPEN or disconnect one lead

UUT POWER: ON
OUTPUT: per table

2.07 CHECK: the DMM voltmeter indicates between:

| UUT | UUT OUTPUT | UUT METER | UUT OUTPUT LIMITS |
|---|---|---|---|
| PAB 32-3 | 32 | 32 (32 F.S.) | 31.04 to 32.96 |
| PAB 18-4.5 | 20 | 20 | 19.6 - 20.4 |
| PAB 18-5.5 | 20 | 20 | 19.6 - 20.4 |
| | | | |

(Meter spec=3% F.S.)

**CURRENT METER ACCURACY**

2.09 Set the UUT VOLTAGE & CURRENT controls for Amps Full Scale (per table) as read on the CURRENT SHUNT METER.

LOAD ..... per table

2.10 CHECK: the UUT ammeter indicates between Amp Limits for each range of the meter. (spec = 2% F.S.)

| Model | Volts | Amps F.L | Load | Amp Limits |
|---|---|---|---|---|
| PAB 32-3 | 32 | 3 | 10.6Ω | 2.91 - 3.09 |
| PAB 18-4.5 | 20 | 4.5 | 4.4Ω | 4.35 - 4.65 |
| PAB 18-5.5 | 20 | 5.5 | 3.6Ω | 5.32 - 5.68 |

2.11 Leave equipment connected for next test.

3.00 **CHECK LOAD REGULATION**

3.01 Adjust UUT output for as close as possible to Table Volts setting as indicated on the Flk 8842A .

(full load connected to output)

3.03 Disconnect one test lead from the Load .

3.04 CHECK: the Flk 8842A indicates limits per table volts (with no load connected).

Repeat for all Outputs.

| Model | Volts | Amps F.L | Load | Reg Limits |
|---|---|---|---|---|
| PAB 32-3 | 32 | 3 | 10.6Ω | 32.0000 ±9.4mV |
| PAB 18-4.5 | 20 | 4.5 | 4.4Ω | 20.0000 ±7mV |
| PAB 18-5.5 | 20 | 5.5 | 3.6Ω | 20.0000 ±7mV |

Note:

$$\% \text{ Load Regulation Error} = \frac{(E_{\text{no load}} - E_{\text{full load}})}{(E_{\text{full load}})} * 100$$

UUT Spec is ± .02% + 3mV

4.00 **CHECK LINE REGULATION**

4.01 Reconnect UUT to the Load .

4.02 SET the: VARIAC output to 115 VAC

Set the UUT VOLTAGE & CURRENT controls for as near Volts (per table) as read on the Fluke 8842A meter.

4.03 Vary the VARIAC output from 105 VAC - 125 VAC .

4.04 CHECK: while varying the Variac between 105 - 125 VAC

the Fluke 8842A indicates per table volts

| Model | Volts | Amps F.L | Load | Reg Limits |
|---|---|---|---|---|
| PAB 32-3 | 32 | 3 | 10.6Ω | 32.0000 ±8.4mV |
| PAB 18-4.5 | 20 | 4.5 | 4.4Ω | 20.0000 ±6mV |
| PAB 18-5.5 | 20 | 5.5 | 3.6Ω | 20.0000 ±6mV |
| | | | | |

UUT Spec is ± .02% + 2mV

5.00 **CHECK NOISE / RIPPLE**

5.01 Connect equipment as in Figures 2 and 2a.

SET SCOPE to: 1 mV /Div AC coupled

Fig. 2

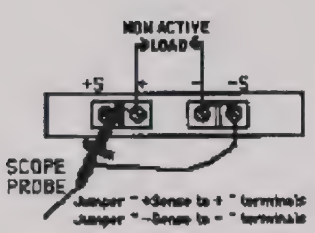
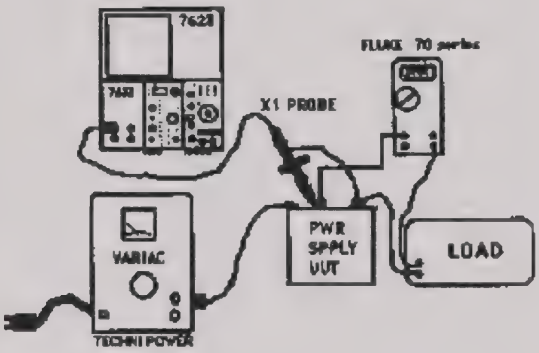



Fig. 2A




5.02 CHECK: pk-pk ripple & noise 5Hz to 1MHz ≤1.4mV pk-pk

(measured w/scope & UUT Pos or Neg terminal grounded).

6.00 **PARTIAL CAL TAG**

6.01 Attach partial Cal tag to the UUT as shown below.

Calibration certified to specifications below:

| | |
|---|---|
| Meter Accuracy ..... | ± 3% F.S. |
| Ripple ..... | ≤1.4mV pk-pk |
| Constant Line Voltage Regulation | ± .02% + 2mV |
| Constant Load Voltage Regulation | ± .02% + 3mV |

## 2. SPECIFICATIONS

| Item \ Model | PAB 18-4.5 | PAB 18-5.5 | PAB 32-3 | PAB | PAB | PAB | PAB | PAB |
|---|---|---|---|---|---|---|---|---|
| Input power | 100 V ±10%, 50/60 Hz single-phase AC | | | | | | | |
| Apparent input power | approx. 190 VA | approx. 220 VA | approx. 210 VA | | | | | |
| Ambient temperature | 0 ~ 40°C | | | | | | | |
| Dimensions (maximum dimensions) | 210 W × 140 H × 149 D mm<br>216 W × 162 H × 190 D mm | | | | | | | |
| Weight | approx. 5.5 kg | | | | | | | |
| Accessories | Operation manual, shorting bar, plug for parallel operation 1 each | | | | | | | |
| Terminals | Positive (red) and negative (white) teminals, horizontal positioning | | | | | | | |
| Floating voltage | ±150 V | | | | | | | |
| Output voltage<br>Continuously variable | 0 ~ 18 V | 0 ~ 18 V | 0 ~ 32 V | | | | | |
| | with coarse and fine control potentiometers | | | | | | | |
| Output current (maximum) | 4.5 A | 5.5 A | 3 A | | | | | |

| Item \ Model | PAB 18-4.5 | PAB 18-5.5 | PAB 32-3 | PAB | PAB | PAB | PAB | PAB |
|---|---|---|---|---|---|---|---|---|
| Ripple | 500 μV rms (5 Hz ~ 1 MHz) | | | | | | | |
| Line voltage regulation | 0.02% + 2 mV (Note 1) | | | | | | | |
| Load regulation | 0.02% + 3 mV (Note 2) | | | | | | | |
| Limiting current | Continuously variable for a range of 10% 100% of rated current (constant-current operation) | | | | | | | |
| Voltmeter (full scale) | 20 V | 20 V | 32 V | | | | | |
| | JIS Class 2.5 | | | | | | | |
| Ammeter (full scale) | 5 A | 6 A | 3.2 A | | | | | |
| | JIS Class 2.5 | | | | | | | |

Note 1: Against ±10% change of AC line voltage

Note 2: Against 0 ~ 100% change of output current

## 3. EXPLANATION OF PANEL ITEMS

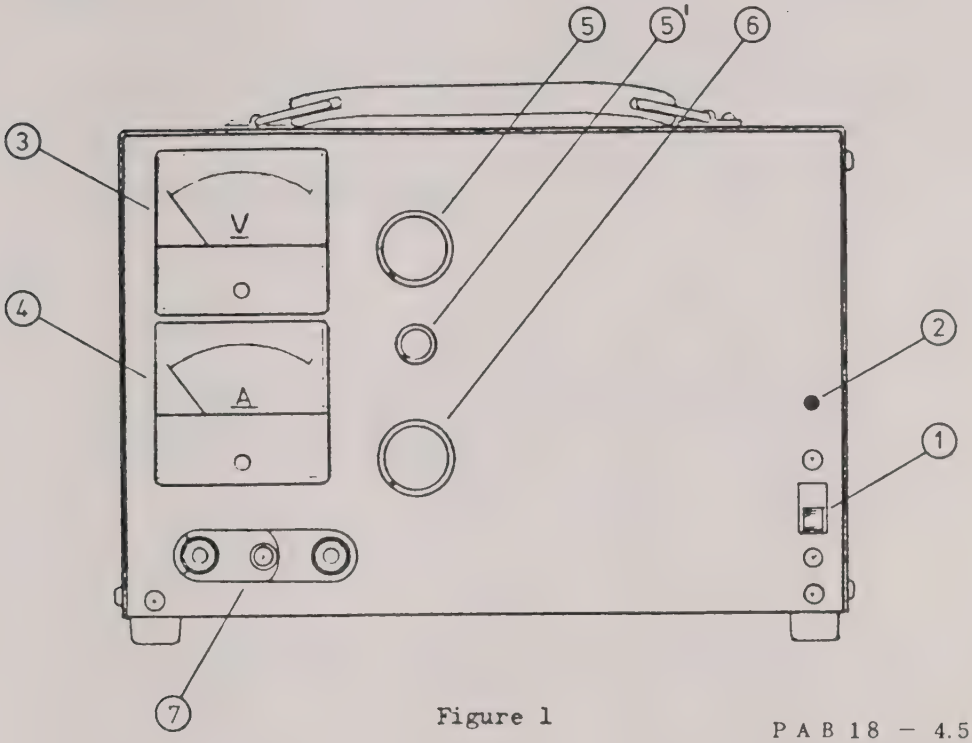



Figure 1

PAB 18 – 4.5
PAB 18 – 5.5
PAB 32 – 3

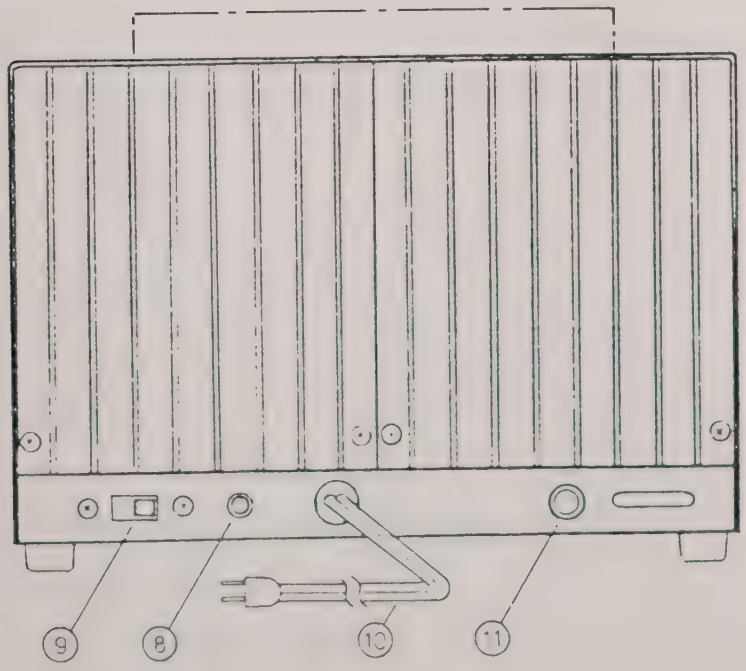



Figure 3

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① POWER switch:

A slide switch for ON-OFF control of the instrument main power.

Indication: "POWER ON OFF"

② Pilot lamp:

A power pilot lamp (green LED) which turns on when the instrument is in operation.

③ Voltmeter:

A DC voltmeter which indicates the output voltage of the power supply.

④ Ammeter:

A DC ammeter which indicates the output current of the power supply.

⑤ ⑤' Output voltage control knobs:

Potentiometers for setting the output voltage at the required value.

PAB Series use a coarse adjustment potentiometer ⑤ and a fine adjustment potentiometer ⑤'.

Indication: "VOLTAGE"

"COARSE, FINE"

⑥ Output current control knob:

Sets the limiting value of the output current, within a range of 10 ~ 100% of the rated current.

Indication: "CURRENT"

⑦ Output terminals:

Binding post terminals for the output power. Normally, the positive or negative terminal is jumpered with the shorting bar to the center screw which is electrically connected to the chassis. It also is possible to provide a DC bias within the rated floating voltage with respect to ground.

⑧ Jack for parallel operation:

Jack for one-control parallel operation, by connecting with the plug (supplied). (Details of parallel operation are explained at a later part of this instruction manual.)

⑨ Master/slave switch:

Switch for selecting the master/slave unit for one-control parallel operation. (Details of parallel operation are explained at a larter part of this instruction manual.)

⑩ AC cable with plug:

AC input power cable; approximately 2 meters long.

⑪ Jack for remote cotrol:

PAB 18-5.5 only. See Section 4.5.

# 4. OPERATION METHOD

## 4.1 Operation

Be sure to connect the GND terminal to a good grounding earth line.

### 4.1.1 Single Operation

The instrument can be directly used as a power supply. Ensure that the master/slave selector switch on the rear panel is set in the M (master) side.

### 4.1.2 Series Operation

Two or more units can be operated in series in order to obtain a higher supply voltage. Note, when in this mode of operation, that the voltage of any terminal must not be higher than the rated floating voltage against chassis. When two units are connected in series, a voltage double of a single unit and a current the same with a single unit can be obtained.

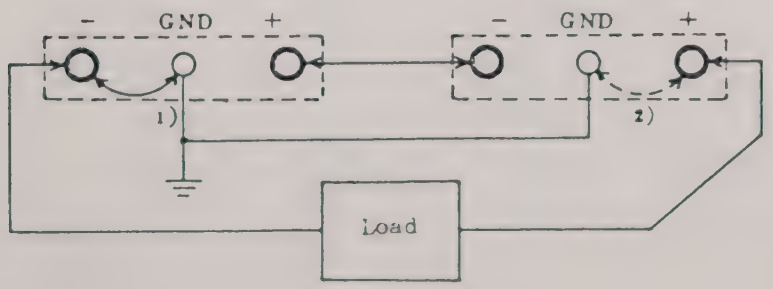


Figure 4

Connect the GND terminal as follows:

(1) For negative grounding:

As indicated with the solid line in Figure 4.

(2) For positive grounding:

As indicated with the dotted line in Figure 4.

Do not connect the GND terminals to terminals of different polarities.

4.1.3 Overload Protection when in Series Operation

If overload is caused with two units are connected in parallel and the protection circuit of one of the two units has tripped, the output voltage of the other unit is applied to the former unit in the reverse polarity and the series control element of the former unit is destroyed. In other to prevent this, a diode is connected in the output circuit of each unit as shown in Figure 5.

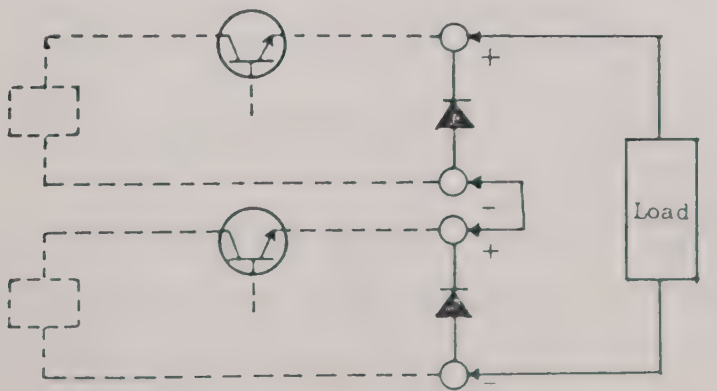


Figure 5

4.1.4 Parallel Operation (one-control operation)

Two units can be connected in parallel doubled output current. When connecting the units for this operation, be sure to turn off the power switches of the units.

When in the parallel operation, one unit operates as a master unit (M) and the other as a slave unit (S). The output voltage and current are controlled by the master unit. The operating procedure is as follows:

(1) On the rear panel of the slave unit, throw the master/slave selector switch to the "S" side.

(2) Connect the output in parallel and connect the parallel operation jack (J4) on the rear panel of the master unit with jack (J4) of the slave unit using the plugs supplied.

(3) Set the CURRENT knob of the slave unit in the maximum current position (extremely clockwise position). Set the VOLTAGE knob also in the maximum position.

(4) Turn-ON the power switches.

When the above setting has been done, the output voltage and current can be controlled by the master unit. The controllable output current limit value in this case is 10% ~ 100% of twice of the current rating of one unit.

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When in the one-control parallel operation, make sure that a load current of not less than 5% of the rated current flows always. If the load current becomes zero or lower than 5%, the output voltage becomes uncontrollable with the master unit and the potentiometer may be damaged.

When returning to the single unit operation, be sure to return the master/slave switch on the rear panel to the M side.

Regarding the jumper bars, connect them for positive ground or negative ground for both master and slave units. Do not connect them in different polarities. (See Figure 6.)

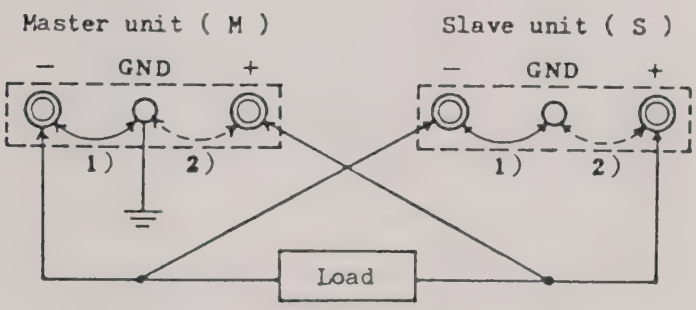



Figure 6

Up to two units of the same model of instruments can be operated in parallel. Instruments of different models cannot be operated in parallel.

Never turn-ON the power switch with the master/slave selector switch set in the S state. The instrument may be damaged if the power switch is turned-ON with the master/slave selector switch set in the S side.

The operatable ranges of two units in series or parallel connection are shown in Figure 7.

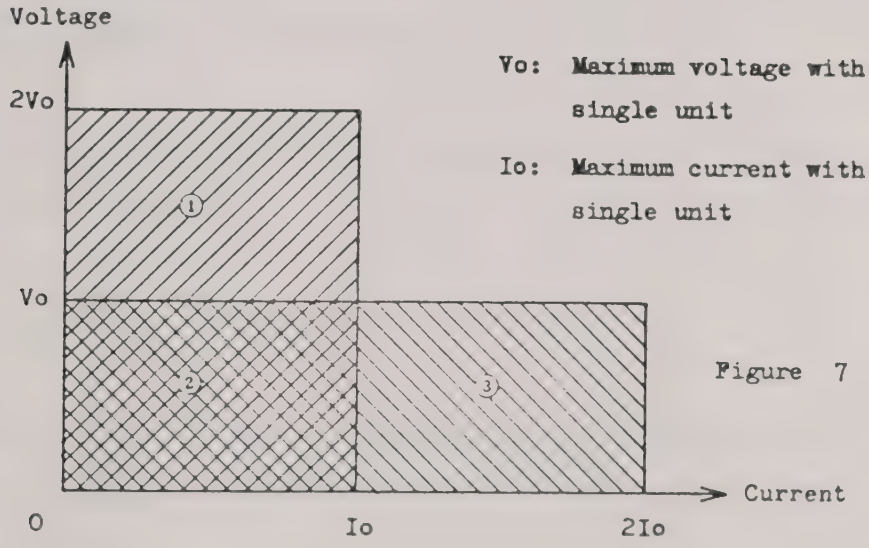



Figure 7

Single-unit operation: Range ②

Series operation: Range ① + ②

Parallel operation: Range ② + ③

## 4.2 Conditions of Use

Do not use the instrument in a position where ambient temperature is not with 0 ~ 40°C.

When ventilation is hampered or the instrument is subjected to direct sunlight or other radiation from a heat source, reduce the output current correspondingly. Pay attention to ventilation of the radiator at a rear section of the instrument.

The normal operating AC line voltage range is 90% ~ 110% of the nominal voltage.

## 4.3 Voltage Drop by Ammeter

The voltage drop caused by the ammeter is automatically compensated for circuitly.

## 4.4 Current Limiting Circuit

In order to protect the series control element and output ammeter against damage which could be caused when the output circuit is short-circuited by mistake, the instrument is incorporated with an electronic output current limiting circuit which positively operates and limits the current within the preset value. The limiting value can be preset within a range of 10% ~ 100% of

the rated current. When the output current has reached the preset value, the instrument operates as a constant-current supply. When the output current has become lower than the preset value, the instrument automatically resumes its operation as a constant-voltage supply. (See Figure 8.)

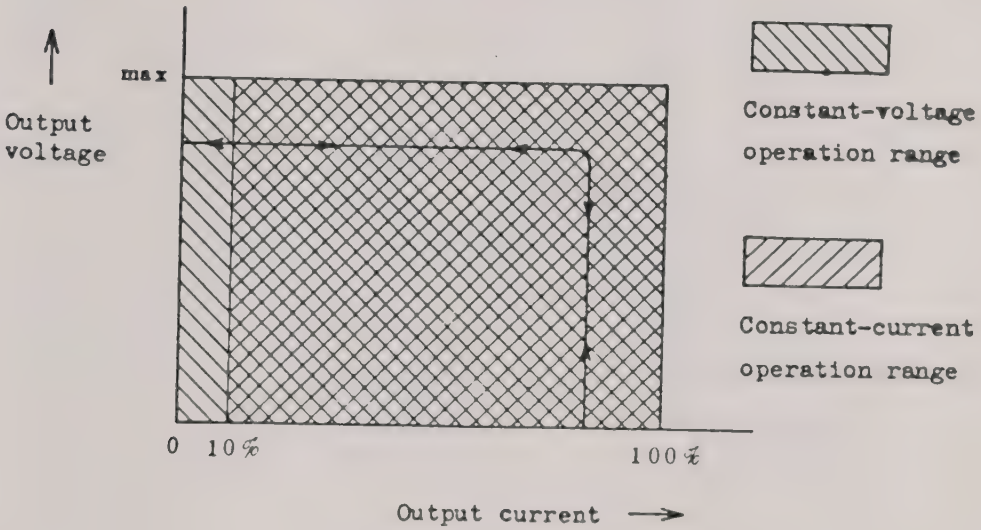



Figure 8

The current limiting circuit provides fairly good constant current regulating characteristics and the instrument can be used as a constant-current supply for most types of loads. The design figures are AC line voltage regulation about 0.1%, load regulation approximately 0.5%, and ripple factor 0.2% rms.

## 4.5 Remote Control ( PAB 18-5.5 only )

A jack for remote control of the output voltage with an external variable resistor is provided on the rear panel of the unit. The jack accepts a large single-head plug (EIAJ RC-707 Stereo Jack).

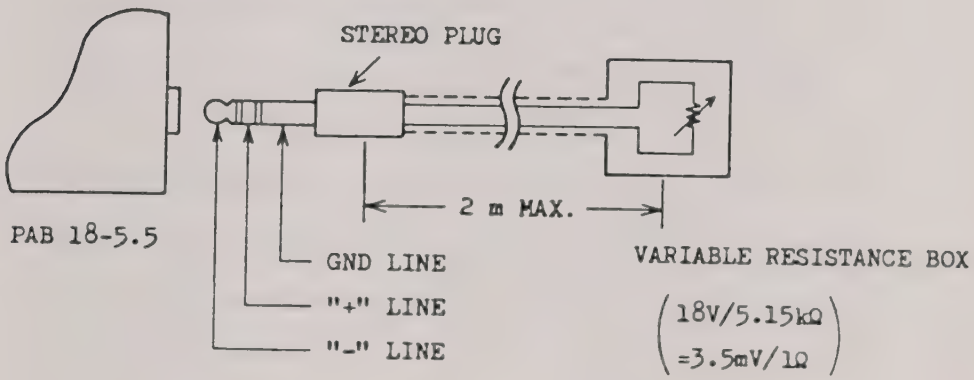



Figure 9

1) Connect the Stereo plug with the variable resistor box using a 2-core shielded cable as shown in Figure 9. (The length of the shielded cable should not exceed approximately 2 meters.) Connect the two core wires of the cable to the "+" and "-" lines and the shielding braid to the GND line.

The variable resistor (or fixed resistor) is approximately 5.15kΩ and should handle an output voltage of 18 V, or it

should operate with approximately 3.5mV/1Ω. Use a wire-wound or metal-film resistor of a sufficient wattage and good temperature coefficient.

2) Set both VOLTAGE knobs on the front panel of PAB 18-5.5 unit in the extremely counterclockwise positions.

3) Insert the Stereo plug in the remote control jack on the rear panel, and turn-ON the POWER switch of the unit.

4) If the resistance become higher than 5.15 kΩ by mistake while in the remote control operation and the output voltage becomed higher than approximately 20 V, the circuit is automatically clamped out.

Model OP-2 Remote Control Box (5 kΩ) is available from Kikusui Electronics Corporation. this control box is capable of 3-point preset voltages electronic switching.

# 5. MAINTENANCE

When the instrument has failed and its component has been replaced or when the meter indication has become shifted, adjust the instrument as explained in this section. First, undo the seven screws and remove the cover.

## 5.1 Calibration of Output Voltmeter

With the power switch OFF, perform mechanical zero adjustment of the voltmeter. Next, connect a precision voltmeter (JIS Class 0.5 or equivalent) to the output terminals, set the output voltage at a value close to the maximum voltage, and so adjust the VM CAL potentiometer of the printed circuit board that the voltmeter indicates the same value as the precision voltmeter.

## 5.2 Calibration of Output Ammeter

Perform zero adjustment of the meter under the state that the power switch is turned ON and the instrument is operating normally in the constant-voltage mode. Connect an appropriate load and a precision ammeter (JIS Class 0.5 or equivalent) in the output circuit and calibrate the instrument ammeter by adjusting the AM CAL potentiometer of the printed circuit board.

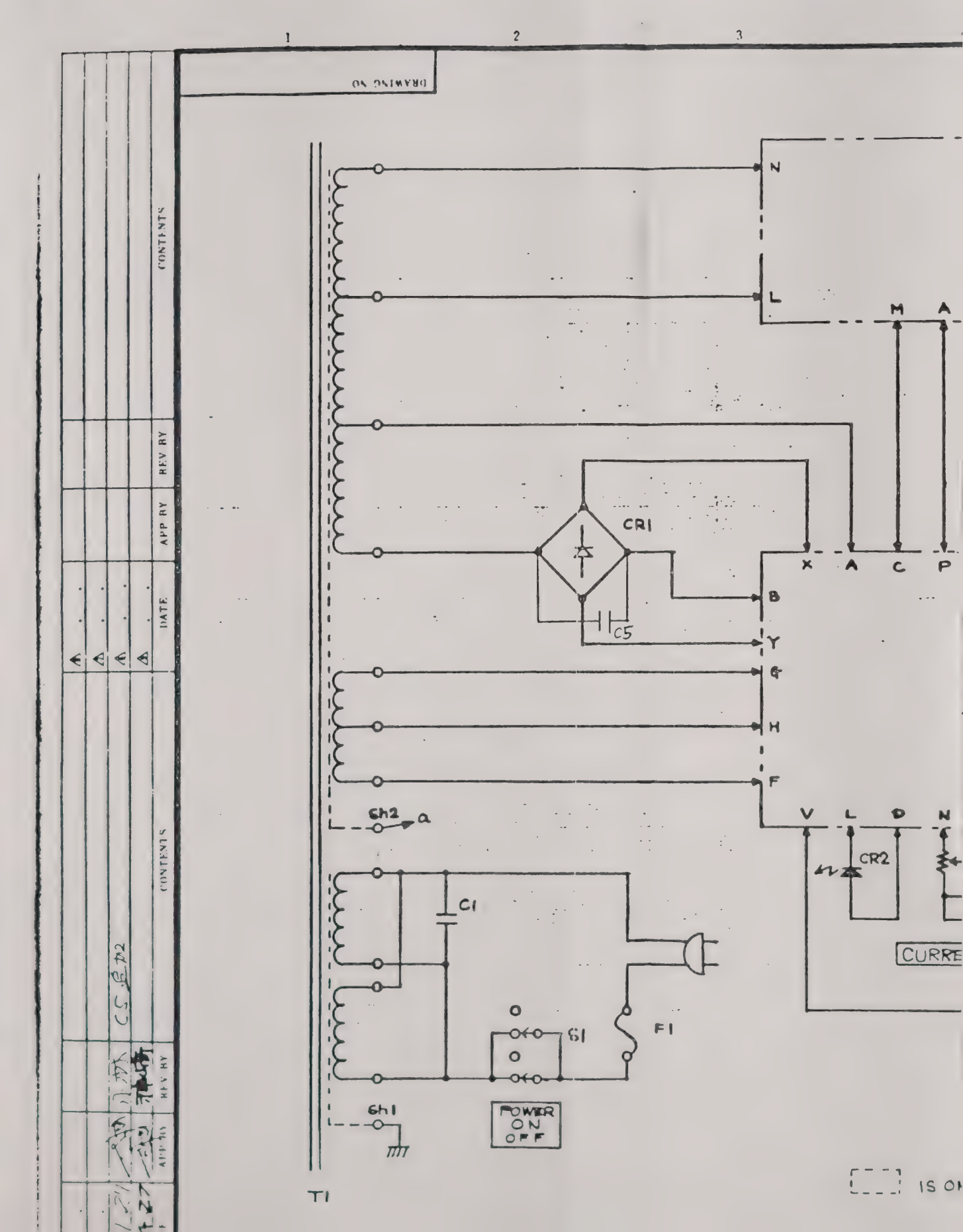
## 5.3 Adjustment of Output Voltage

With the VOLTAGE control knobs turned to the extremely clockwise position, so adjust the EO CAL potentiometer of the printed board that the output voltage becomes approximately 105% of the rated voltage.

## 5.4 Adjustment of Output Current

With an ammeter connected to the output terminals and the CURRENT control knob turned to the extremely clockwise position, so adjust the IO CAL potentiometer of the printed circuit board that the current reading becomes approximately 110% of the rated current.

Do not tamper with other potentiometers.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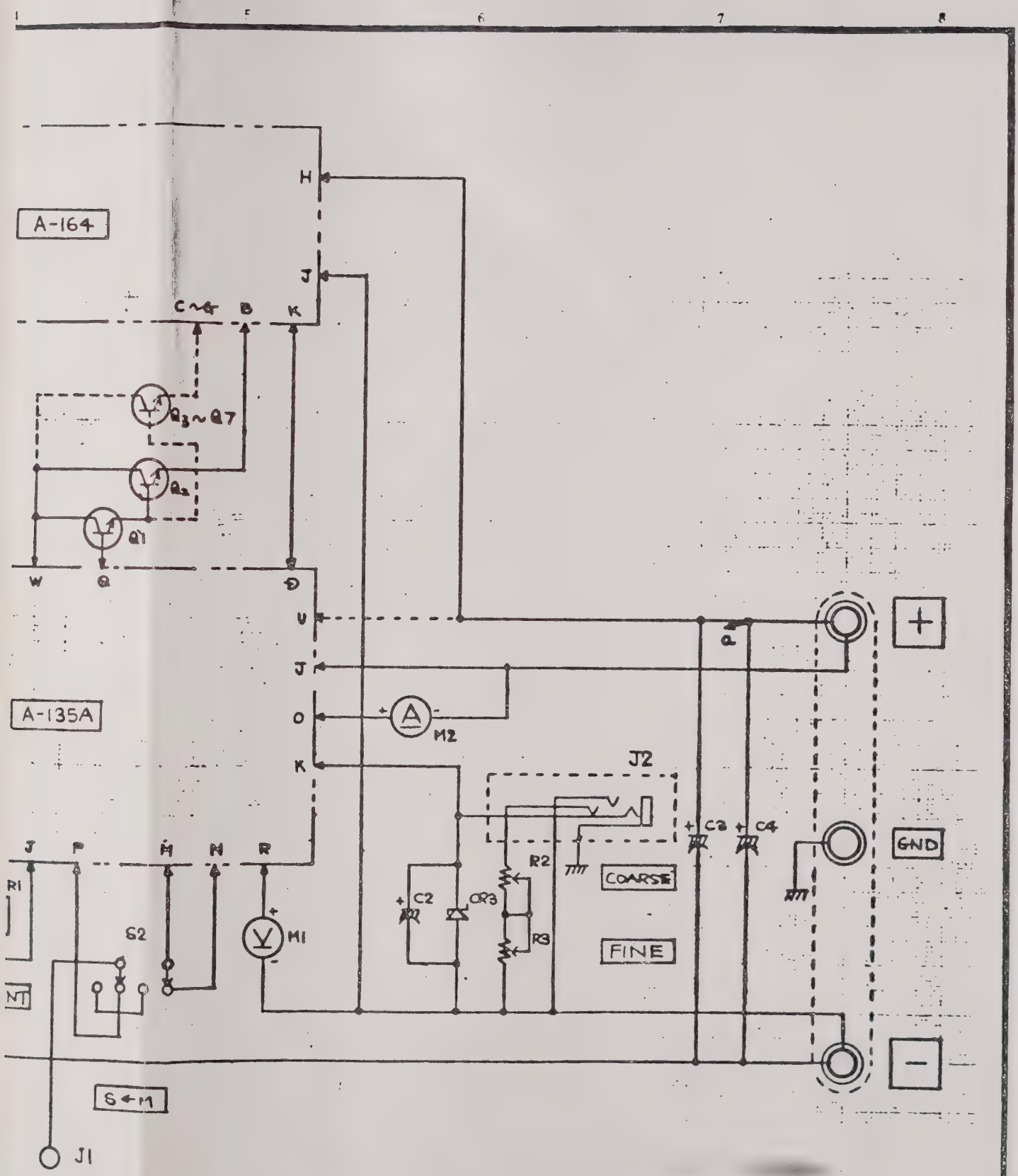


ULY USED BY TYPE PAB18-5.5 .

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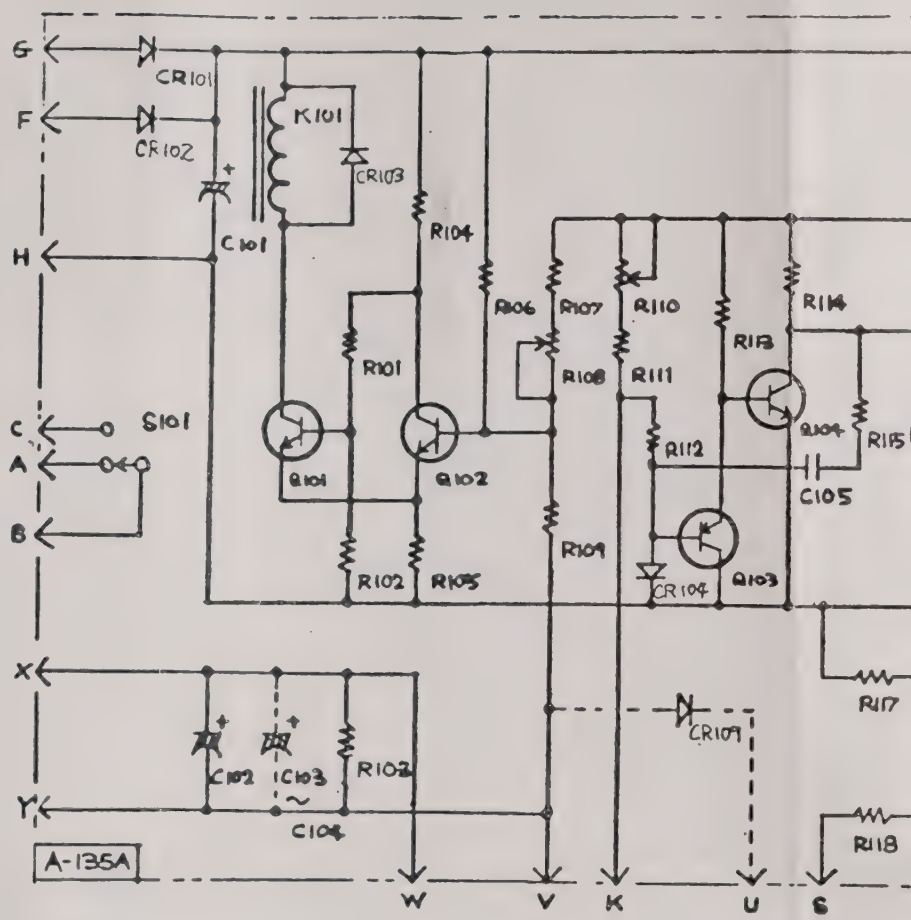
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Q102
Q103
Q104
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R105
R109
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CR109
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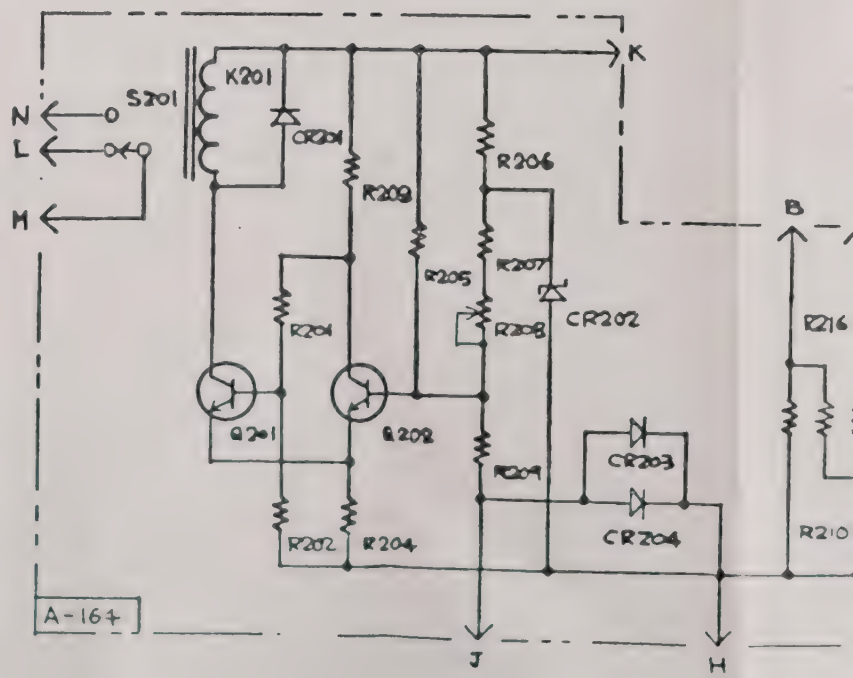
C103
R103
C104
R118
A-135A
W
V
K
U
S


K
S201
K201
N
L
H
CR201
R209
R206
B
R205
R207
CR202
R208
R216
R201
Q201
Q202
R209
CR203
CR204
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A-164
J
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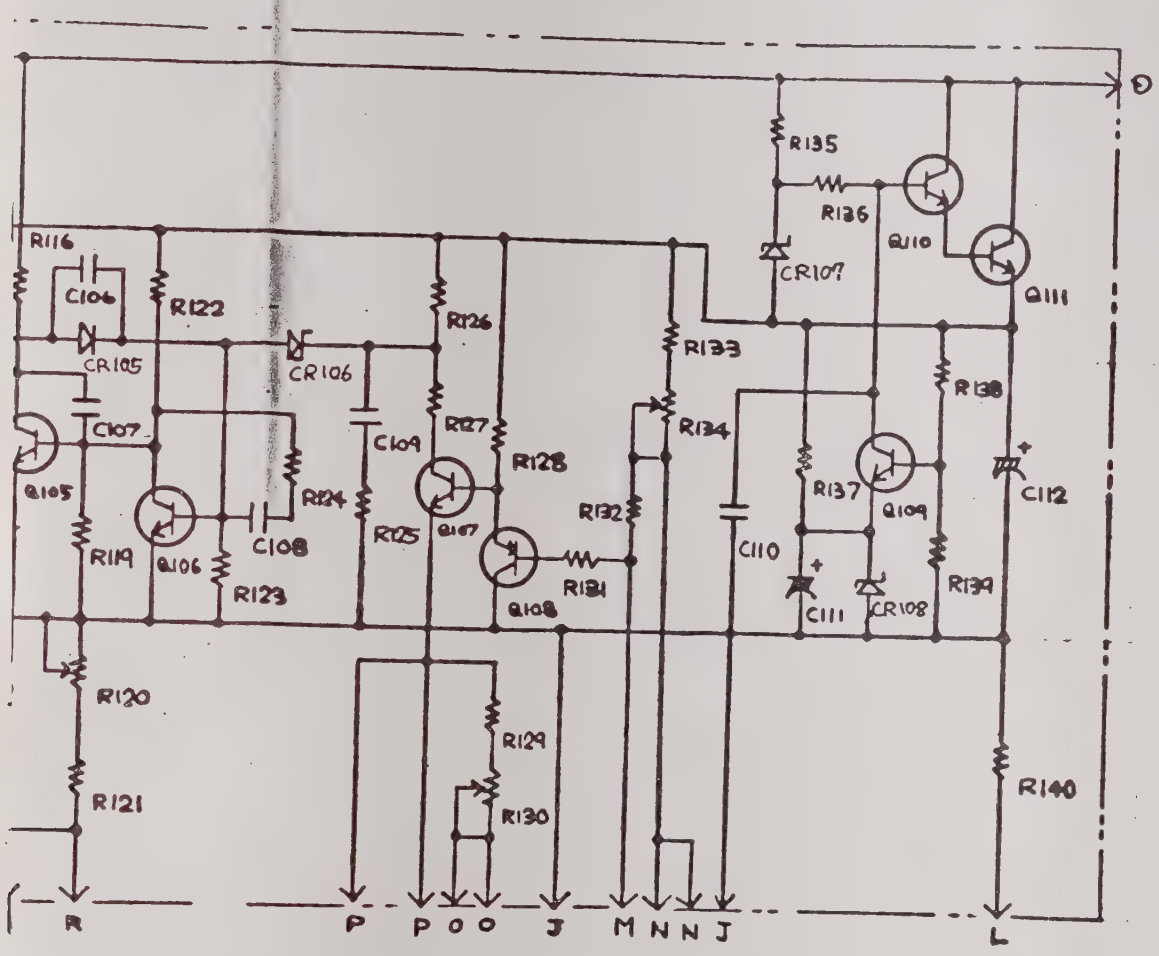
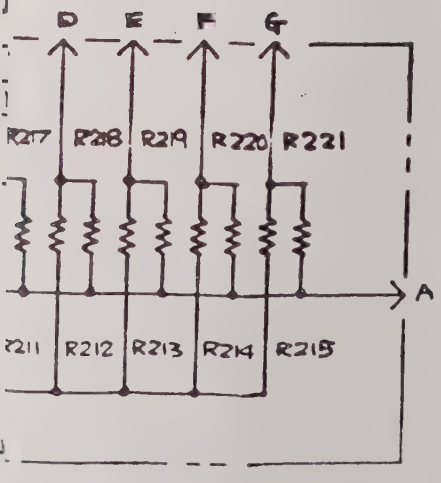
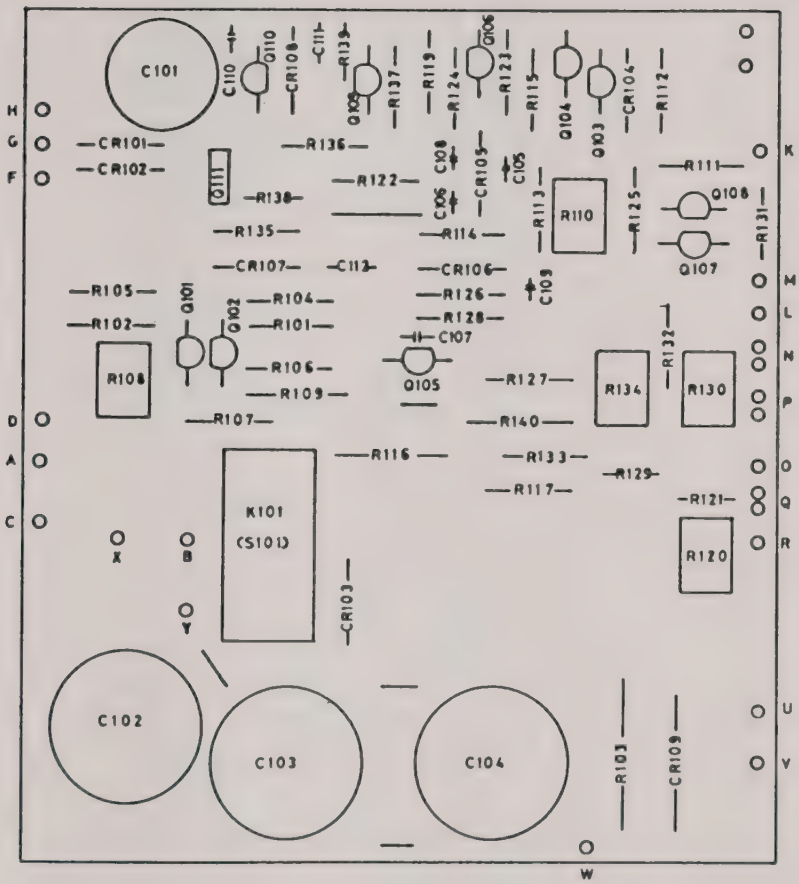



KIKUSUI ELECTRONICS CORPORATION

TITLE A-135A A-164

CODE NO




A-135A PARTS LOCATION DIAGRAM

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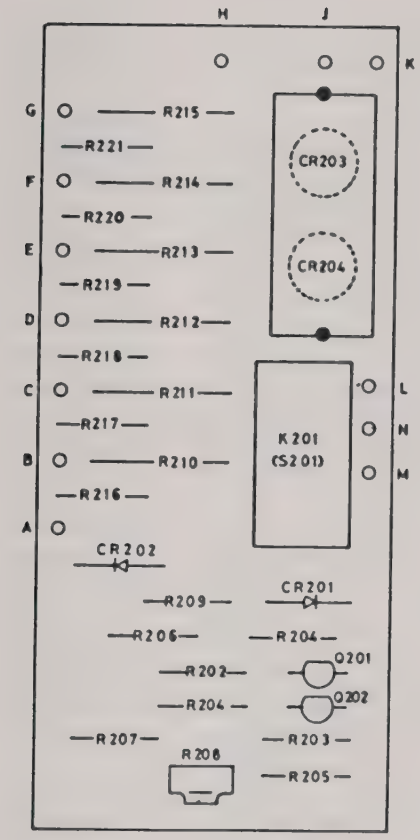


A-164 PARTS LOCATION DIAGRAM

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PAB18-4.5 REPLACEABLE PARTS

| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| A-135A PC BOARD ASSEMBLY | | | |
| C101 | 54-00-0324 | FXD ELECT 470μF 50V | |
| C102 | 54-30-2051 | FXD ELECT 4700μF 35V | |
| C103 | 54-30-2051 | FXD ELECT 4700μF 35V | |
| C104 | 54-30-2051 | FXD ELECT 4700μF 35V | |
| C105 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C106 | 50-67-0040 | FXD PLSTC 0.022μF 10% 100V | |
| C107 | 50-67-0010 | FXD PLSTC 0.0022μF 10% 100V | |
| C108 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C109 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C110 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C111 | 54-00-0311 | FXD ELECT 10μF 50V | |
| C112 | 54-00-0114 | FXD ELECT 47μF 25V | |
| CR101 | 32-90-0523 | DIODE VRM=600V Io=1A | TOSHIBA S5277J |
| CR102 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR103 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR104 | 32-11-5880 | DIODE VR=30V Io=120mA | TOSHIBA 1S1588 |
| CR105 | 32-11-5880 | DIODE | TOSHIBA 1S1588 |
| CR106 | 32-91-1800 | DIODE ZENER VZ=5.3-6.3V | NEC RD5.6J-B |
| CR107 | 32-91-1820 | DIODE ZENER VZ=6.4-7.2V | NEC RD6.8J-B |
| CR108 | 32-90-0230 | DIODE ZENER VZ=6.2±0.2V AT IZ=1 mA | TOSHIBA 02Z62A SELECT |
| CR109 | - | NOT USED IN THIS MODEL | |
| K101 | 71-08-0091 | RELAY DC 24V | IZUMI RH1V2-U |
| Q101 | 30-32-1201 | TR NPN | TOSHIBA 2SC2120-Y |
| Q102 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q103 | 30-10-4952 | TR PNP | TOSHIBA 2SA495G-TM-Y |
| Q104 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q105 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q106 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q107 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q108 | 30-10-4952 | TR PNP | TOSHIBA 2SA495G-TM-Y |
| Q109 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q110 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q111 | 30-40-4141 | TR NPN | NEC 2SD414-Q |
| R101 | 40-27-2122 | FXD C FILM 1.2kΩ 5% 1/4W | |
| R102 | 40-27-1332 | FXD C FILM 330Ω 5% 1/4W | |
| R103 | 44-92-2150 | FXD M OX 1.5kΩ 5% 2W | |
| R104 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R105 | 40-27-0332 | FXD C FILM 3kΩ 5% 1/4W | |
| R106 | 40-27-4152 | FXD C FILM 150kΩ 5% 1/4W | |
| R107 | 40-27-3102 | FXD C FILM 10kΩ 5% 1/4W | |
| R108 | 45-41-2500 | VAR C COMP 5kΩ | HDK VZ082KLB 5kΩ |
| R109 | 40-27-2822 | FXD C FILM 8.2kΩ 5% 1/4W | |
| R110 | 48-27-2100 | VAR M GLAZE 1kΩ | HDK VG083L1B 1kΩ |



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| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| R111 | 42-94-2240 | FXD M FILM 2.4kΩ 1% 1/2W | |
| R112 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R113 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R114 | 40-27-3332 | FXD C FILM 33kΩ 5% 1/4W | |
| R115 | 40-27-1682 | FXD C FILM 680Ω 5% 1/4W | |
| R116 | 44-92-1220 | FXD M OX 220Ω 5% 2W | |
| R117 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R118 | - | NOT USED IN THIS MODEL | |
| R119 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R120 | 45-41-3200 | VAR C COMP 20kΩ | HDK VZ083L1B 20kΩ |
| R121 | 42-94-3910 | FXD M FILM 91kΩ 1% 1/2W | |
| R122 | 40-27-2472 | FXD C FILM 4.7kΩ 5% 1/4W | |
| R123 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R124 | 40-27-2152 | FXD C FILM 1.5kΩ 5% 1/4W | |
| R125 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R126 | 40-27-3182 | FXD C FILM 18kΩ 5% 1/4W | |
| R127 | 40-27-2152 | FXD C FILM 1.5kΩ 5% 1/4W | |
| R128 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R129 | 42-94-1270 | FXD M FILM 270Ω 1% 1/4W | |
| R130 | 45-41-1100 | VAR C COMP 100Ω | HDK VZ083L1B 100Ω |
| R131 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R132 | 40-27-3102 | FXD C FILM 10kΩ 5% 1/4W | |
| R133 | 40-27-3102 | FXD C FILM 10kΩ 5% 1/4W | |
| R134 | 45-41-2500 | VAR C COMP 5kΩ | HDK VZ083L1B 5kΩ |
| R135 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R136 | 40-27-3562 | FXD C FILM 56kΩ 5% 1/4W | |
| R137 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R138 | 42-94-2680 | FXD M FILM 6.8kΩ 5% 1/4W | |
| R139 | 42-94-3150 | FXD M FILM 15kΩ 5% 1/4W | |
| R140 | 44-91-2220 | FXD M OX 2.2kΩ 5% 1W | |
| A-164 PC BOARD ASSEMBLY | | | |
| CR201 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR202 | 32-91-1910 | DIODE ZENER VZ=15.3-17.1V | NEC RD16J-B |
| CR203(CR204) | 30-90-1740 | DIODE | TOSHIBA 5D2Z11 |
| K201 | 71-08-0091 | RELAY DC24V | IZUMI RH1V2-U |
| Q201 | 30-32-1201 | TR NPN | TOSHIBA 2SC2120-Y |
| Q202 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| R201 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R202 | 40-27-1332 | FXD C FILM 330Ω 5% 1/4W | |
| R203 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R204 | 40-27-0332 | FXD C FILM 33Ω 5% 1/4W | |
| R205 | 40-27-4152 | FXD C FILM 150kΩ 5% 1/4W | |
| R206 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R207 | 40-27-3152 | FXD C FILM 15kΩ 5% 1/4W | |
| R208 | 45-38-2500 | VAR C COMP 5kΩ-B | HDK VZ103KTH1 5kΩ |



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| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| R209 | 40-27-3122 | FXD C FILM 12kΩ 5% 1/4W | |
| R210 | 43-58-0260 | FXD W W 0.68Ω 10% 2W | |
| R211 | 43-58-0260 | FXD W W 0.68Ω 10% 2W | |
| R212 | 43-58-0260 | FXD W W 0.68Ω 10% 2W | |
| R213 | 43-58-0260 | FXD W W 0.68Ω 10% 2W | |
| R214 | 43-58-0260 | FXD W W 0.68Ω 10% 2W | |
| R215 | - | NOT USED IN THIS MODEL | |
| R216 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R217 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R218 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R219 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R220 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R221 | - | NOT USED IN THIS MODEL | |
| CHASSIS MOUNTED PARTS | | | |
| C1 | 50-76-2510 | FXD PLSTC 0.1μF AC 250V | |
| C2 | 54-00-0304 | FXD ELECT 4.7μF 50V | |
| C3 | 54-01-0311 | FXD ELECT 10μF 50V | |
| C4 | 54-01-0122 | FXD ELECT 220μF 25V | |
| C5 | 50-67-0060 | FXD PLSTC 0.1μF 10% 100V | |
| CR1 | 32-90-1640 | DIODE BRIDGE | SHINDENGEN S10VB10 |
| CR2 | 37-00-0150 | LED GREEN | SHARP GL-4PG2 |
| CR3 | - | NOT USED IN THIS MODEL | |
| F1 | 99-02-0105 | FUSE 4A | |
| M1 | 70-20-0262 | METER 20V/DC | KIKUSUI S780935 |
| M2 | 70-20-0282 | METER 5A/DC | KIKUSUI S783340 |
| Q1 | 30-40-5261 | TR NPN | TOSHIBA 2SD526-Y |
| Q2 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q3 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q4 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q5 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q6 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q7 | - | NOT USED IN THIS MODEL | |
| R1 | 45-13-2101 | VAR C COMP 1kΩ-B | NOBLE RV24YN20S |
| R2 | 47-13-2501 | VAR W W 5kΩ-B | NOBLE RA25YN20S |
| R3 | 47-12-1300 | VAR W W 300Ω-B | NOBLE RA20YN20S |
| S1 | 82-42-0000 | SW SLIDE (POWER) | |
| S2 | 82-42-0000 | SW SLIDE (M-S) | |
| T1 | 60-45-0030 | P.T PAB18-4.5 | KIKUSUI S790047 |



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| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| MISCELLANEOUS | | | |
| OUTPUT TERMINALS | | | |
| | N6-000-081 | BINDING POST (TRIPLE) | |
| | N6-000-041 | KNOB RED FOR BINDING POST | |
| | N6-000-061 | KNOB WHITE FOR BINDING POST | |
| KNOB | | | |
| | N1-000-011 | KNOB FOR VOLTAGE FINE | KIKUSUI R12SB |
| | N1-000-072 | KNOB FOR VOLTAGE COARSE AND CURRENT | KIKUSUI R18SB-N |
| SHORT BAR | | | |
| | E3-000-071 | SHORT BAR (BINDING POST) | |

813522

## PAB18-5.5 REPLACEABLE PARTS

| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| A-135A PC BOARD ASSEMBLY | | | |
| C101 | 54-00-0324 | FXD ELECT 470μF 50V | |
| C102 | 54-30-2051 | FXD ELECT 4700μF 35V | |
| C103 | 54-30-2051 | FXD ELECT 4700μF 35V | |
| C104 | 54-30-2051 | FXD ELECT 4700μF 35V | |
| C105 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C106 | 50-67-0030 | FXD PLSTC 0.01μF 10% 100V | |
| C107 | 50-67-0010 | FXD PLSTC 0.0022μF 10% 100V | |
| C108 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C109 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C110 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C111 | 54-00-0311 | FXD ELECT 10μF 50V | |
| C112 | 54-00-0114 | FXD ELECT 47μF 25V | |
| CR101 | 32-90-0523 | DIODE VRM=600V Io=1A | TOSHIBA S5277J |
| CR102 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR103 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR104 | 32-11-5880 | DIODE VR=30V Io=120mA | TOSHIBA 1S1588 |
| CR105 | 32-11-5880 | DIODE | TOSHIBA 1S1588 |
| CR106 | 32-91-1800 | DIODE ZENER VZ=5.3-6.3V | NEC RD5.6J-B |
| CR107 | 32-91-1820 | DIODE ZENER VZ=6.4-7.2V | NEC RD6.8J-B |
| CR108 | 32-90-0230 | DIODE ZENER VZ=6.2±0.2V AT IZ=1mA | TOSHIBA 02Z6.2A SELECT |
| CR109 | - | NOT USED IN THIS MODEL | |
| K101 | 71-08-0091 | RELAY DC24V | IZUMI RH1V2-U |
| Q101 | 30-32-1201 | TR NPN | TOSHIBA 2SC2120-Y |
| Q102 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q103 | 30-10-4952 | TR PNP | TOSHIBA 2SA495G-TM-Y |
| Q104 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q105 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q106 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q107 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q108 | 30-10-4952 | TR PNP | TOSHIBA 2SA495G-TM-Y |
| Q109 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q110 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q111 | 30-40-4141 | TR NPN | NEC 2SD414-Q |
| R101 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R102 | 40-27-1332 | FXD C FILM 330Ω 5% 1/4W | |
| R103 | 44-92-2150 | FXD M OX 1.5kΩ 5% 2W | |
| R104 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R105 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R106 | 40-27-4152 | FXD C FILM 150kΩ 5% 1/4W | |
| R107 | 40-27-2392 | FXD C FILM 3.9kΩ 5% 1/4W | |

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| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| R108 | 45-41-2500 | VAR C COMP 5kΩ | HDK VZ082KLB 5kΩ |
| R109 | 40-27-2392 | FXD C FILM 3.9kΩ 5% 1/4W | |
| R110 | 48-27-2100 | VAR M GLAZE 1kΩ | HDK VG083L1B 1kΩ |
| R111 | 42-94-2240 | FXD M FILM 2.4kΩ 1% 1/2W | |
| R112 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R113 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R114 | 40-27-3392 | FXD C FILM 39kΩ 5% 1/4W | |
| R115 | 40-27-1682 | FXD C FILM 680Ω 5% 1/4W | |
| R116 | 44-92-1220 | FXD M OX 220Ω 5% 2W | |
| R117 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R118 | - | NOT USED IN THIS MODEL | |
| R119 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R120 | 45-41-3200 | VAR C COMP 20kΩ | HDK VZ083L1B 20kΩ |
| R121 | 42-94-3910 | FXD M FILM 91kΩ 1% 1/2W | |
| R122 | 40-27-2472 | FXD C FILM 4.7kΩ 5% 1/4W | |
| R123 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R124 | 40-27-0562 | FXD C FILM 56Ω 5% 1/4W | |
| R125 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R126 | 40-27-3182 | FXD C FILM 18kΩ 5% 1/4W | |
| R127 | 40-27-2152 | FXD C FILM 1.5kΩ 5% 1/4W | |
| R128 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R129 | 42-94-1270 | FXD M FILM 270Ω 1% 1/4W | |
| R130 | 45-41-1100 | VAR C COMP 100Ω | HDK VZ083L1B 100Ω |
| R131 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R132 | 40-27-3102 | FXD C FILM 10kΩ 5% 1/4W | |
| R133 | 40-27-3222 | FXD C FILM 22kΩ 5% 1/4W | |
| R134 | 45-41-3100 | VAR C COMP 10kΩ | HDK VZ083L1B 10kΩ |
| R135 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R136 | 40-27-3562 | FXD C FILM 56kΩ 5% 1/4W | |
| R137 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R138 | 42-94-2680 | FXD M FILM 6.8kΩ 5% 1/4W | |
| R139 | 42-94-3150 | FXD M FILM 15kΩ 5% 1/4W | |
| R140 | 44-91-2220 | FXD M OX 2.2kΩ 5% 1W | |
| A-164 PC BOARD ASSEMBLY | | | |
| CR201 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR202 | 32-91-1910 | DIODE ZENER VZ=15.3-17.1V | NEC RD16J-B |
| CR203(CR204) | 30-90-1740 | DIODE | TOSHIBA 5D2Z11 |
| K201 | 71-08-0091 | RELAY DC24V | IZUMI RH1V2-U |
| Q201 | 30-32-1201 | TR NPN | TOSHIBA 2SC2120-Y |
| Q202 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| R201 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R202 | 40-27-1332 | FXD C FILM 330Ω 5% 1/4W | |
| R203 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R204 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R205 | 40-27-4152 | FXD C FILM 150kΩ 5% 1/4W | |

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| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| R206 | 40-27-2122 | FXD C FILM 1.2kΩ 5% 1/4W | |
| R207 | 40-27-2682 | FXD C FILM 6.8kΩ 5% 1/4W | |
| R208 | 45-38-2500 | VAR C COMP 5kΩ-B | HDK VZ103KTH1 5kΩ |
| R209 | 40-27-2682 | FXD C FILM 6.8kΩ 5% 1/4W | |
| R210 | 43-58-0310 | FXD W W 0.33Ω 10% 2W | |
| R211 | 43-58-0310 | FXD W W 0.33Ω 10% 2W | |
| R212 | 43-58-0310 | FXD W W 0.33Ω 10% 2W | |
| R213 | 43-58-0310 | FXD W W 0.33Ω 10% 2W | |
| R214 | 43-58-0310 | FXD W W 0.33Ω 10% 2W | |
| R215 | 43-58 0310 | FXD W W 0.33Ω 10% 2W | |
| R216 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R217 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R218 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R219 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R220 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R221 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| CHASSIS MOUNTED PARTS | | | |
| C1 | 50-76-2510 | FXD PLSTC 0.1μF AC 250V | |
| C2 | 54-00-0304 | FXD ELECT 4.7μF 50V | |
| C3 | 54-01-0311 | FXD ELECT 10μF 50V | |
| C4 | 54-01-0122 | FXD ELECT 220μF 25V | |
| C5 | 50-67-0060 | FXD PLSTC 0.1μF 10% 100V | |
| CR1 | 32-90-1640 | DIODE BRIDGE | SHINDENGEN S10VB10 |
| CR2 | 37-00-0150 | LED GREEN | SHARP GL-4PG2 |
| CR3 | 32-91-1940 | DIODE ZENER VZ=20.8-23.3V | NEC RD22J-B |
| F1 | 99-02-0105 | FUSE 4A | |
| M1 | 70-20-0262 | METER 20V/DC | KIKUSUI S780935 |
| M2 | 70-20-0292 | METER 6A/DC | KIKUSUI S781518 |
| Q1 | 30-40-5261 | TR NPN | TOSHIBA 2SD526-Y |
| Q2 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q3 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q4 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q5 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q6 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| Q7 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-0 |
| R1 | 45-13-2101 | VAR C COMP 1kΩ-B | NOBLE RV24YN20S |
| R2 | 47-13-2501 | VAR W W 5kΩ-B | NOBLE RA25YN20S |
| R3 | 47-12-1300 | VAR W W 300Ω-B | NOBLE RA20YN20S |
| S1 | 82-42-0000 | SW SLIDE (POWER) | |
| S2 | 82-42-0000 | SW SLIDE (M-S) | |
| T1 | 60-45-0150 | P.T PAB 18-5.5 | KIKUSUI S760844 |



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| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| MISCELLANEOUS | | | |
| JACK | 85-90-0050 | JACK (WITH STOPPER) | SYOWA MUSEN 3P64M |
| OUTPUT TERMINALS | | | |
| | N6-000-081 | BINDING POST (TRIPLE) | |
| | N6-000-041 | KNOB RED FOR BINDING POST | |
| | N6-000-061 | KNOB WHITE FOR BINDING POST | |
| KNOB | | | |
| | N1-000-011 | KNOB FOR VOLTAGE FINE | KIKUSUI R12SB |
| | N1-000-072 | KNOB FOR VOLTAGE COARSE AND CURRENT | KIKUSUI R18SB-N |
| SHORT BAR | | | |
| | E3-000-071 | SHORT BAR (BINDING POST) | |

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## PAB32-3 REPLACEABLE PARTS

| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| A-135A PC BOARD ASSEMBLY | | | |
| C101 | 54-00-0324 | FXD ELECT 470μF 50V | |
| C102 | 54-40-2001 | FXD ELECT 2200μF 63V | |
| C103 | 54-40-2001 | FXD ELECT 2200μF 63V | |
| C104 | 54-40-2001 | FXD ELECT 2200μF 63V | |
| C105 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C106 | 50-67-0040 | FXD PLSTC 0.022μF 10% 100V | |
| C107 | 50-67-0010 | FXD PLSTC 0.0022μF 10% 100V | |
| C108 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C109 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C110 | 50-67-0000 | FXD PLSTC 0.001μF 10% 100V | |
| C111 | 54-00-0311 | FXD ELECT 10μF 50V | |
| C112 | 54-00-0114 | FXD ELECT 47μF 25V | |
| CR101 | 32-90-0523 | DIODE VRM=600V Io=1A | TOSHIBA S5277J |
| CR102 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR103 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR104 | 32-11-5880 | DIODE VR=30V Io=120mA | TOSHIBA 1S1588 |
| CR105 | 32-11-5880 | DIODE | TOSHIBA 1S1588 |
| CR106 | 32-91-1800 | DIODE ZENER VZ=5.3-6.3V | NEC RD5.6J-B |
| CR107 | 32-91-1820 | DIODE ZENER VZ=6.4-7.2V | NEC RD6.8J-B |
| CR108 | 32-90-0230 | DIODE ZENER VZ=6.2±0.2V AT IZ=1mA | TOSHIBA 02Z6.2A SELECT |
| CR109 | 32-90-0490 | DIODE | HITACHI U05CX2 |
| K101 | 71-08-0091 | RELAY DC24V | IZUMI RH1V2-U |
| Q101 | 30-32-1201 | TR NPN | TOSHIBA 2SC2120-Y |
| Q102 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q103 | 30-10-4952 | TR PNP | TOSHIBA 2SA495G-TM-Y |
| Q104 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q105 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q106 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q107 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q108 | 30-10-4952 | TR PNP | TOSHIBA 2SA495G-TM-Y |
| Q109 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q110 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| Q111 | 30-40-4141 | TR NPN | NEC 2SD414-Q |
| R101 | 40-27-2122 | FXD C FILM 1.2kΩ 5% 1/4W | |
| R102 | 40-27-1322 | FXD C FILM 330Ω 5% 1/4W | |
| R103 | 44-92-2270 | FXD M OX 2.7kΩ 5% 2W | |
| R104 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R105 | 40-27-0332 | FXD C FILM 33Ω 5% 1/4W | |
| R106 | 40-27-4152 | FXD C FILM 150kΩ 5% 1/4W | |
| R107 | 40-27-2562 | FXD C FILM 5.6kΩ 5% 1/4W | |



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| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| R108 | 45-41-2500 | VAR C COMP 5kΩ | HDK VZ082KLB 5kΩ |
| R109 | 40-27-3102 | FXD C FILM 10kΩ 5% 1/4W | |
| R110 | 48-27-2100 | VAR M GLAZE 1kΩ | HDK VG083L1B 1kΩ |
| R111 | 42-94-2270 | FXD M FILM 2.7kΩ 1% 1/2W | |
| R112 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R113 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R114 | 40-27-3392 | FXD C FILM 39kΩ 5% 1/4W | |
| R115 | 40-27-1682 | FXD C FILM 680Ω 5% 1/4W | |
| R116 | 44-92-1330 | FXD M OX 330Ω 5% 2W | |
| R117 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R118 | - | NOT USED IN THIS MODEL | |
| R119 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R120 | 45-41-3200 | VAR C COMP 20kΩ | HDK VZ083L1B 20kΩ |
| R121 | 42-94-4150 | FXD M FILM 150kΩ 1% 1/2W | |
| R122 | 40-27-2472 | FXD C FILM 4.7kΩ 5% 1/4W | |
| R123 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R124 | 40-27-2152 | FXD C FILM 1.5kΩ 5% 1/4W | |
| R125 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R126 | 40-27-3182 | FXD C FILM 18kΩ 5% 1/4W | |
| R127 | 40-27-2152 | FXD C FILM 1.5kΩ 5% 1/4W | |
| R128 | 40-27-3472 | FXD C FILM 47kΩ 5% 1/4W | |
| R129 | 42-94-1270 | FXD M FILM 270Ω 1% 1/4W | |
| R130 | 45-41-1100 | VAR C COMP 100Ω | HDK VZ083L1B 100Ω |
| R131 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R132 | 40-27-3102 | FXD C FILM 10kΩ 5% 1/4W | |
| R133 | 40-27-3102 | FXD C FILM 10kΩ 5% 1/4W | |
| R134 | 45-41-2500 | VAR C COMP 5kΩ | HDK VZ083L1B 5kΩ |
| R135 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R136 | 40-27-3562 | FXD C FILM 56kΩ 5% 1/4W | |
| R137 | 40-27-2102 | FXD C FILM 1kΩ 5% 1/4W | |
| R138 | 42-94-2680 | FXD M FILM 6.8kΩ 5% 1/4W | |
| R139 | 42-94-3150 | FXD M FILM 15kΩ 5% 1/4W | |
| R140 | 44-91-2220 | FXD M OX 2.2kΩ 5% 1W | |
| A-164 PC BOARD ASSEMBLY | | | |
| CR201 | 32-90-0523 | DIODE | TOSHIBA S5277J |
| CR202 | 32-91-1910 | DIODE ZENER VZ=15.3=17.1V | NEC RD16J-B |
| CR203(CR204) | - | NOT USED IN THIS MODEL | |
| K201 | 71-08-0091 | RELAY DC24V | IZUMI RH1V2-U |
| Q201 | 30-32-1201 | TR NPN | TOSHIBA 2SC2120-Y |
| Q202 | 30-30-3722 | TR NPN | TOSHIBA 2SC372G-TM-Y |
| R201 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R202 | 40-27-1332 | FXD C FILM 330Ω 5% 1/4W | |
| R203 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |
| R204 | 40-27-0332 | FXD C FILM 33Ω 5% 1/4W | |
| R205 | 40-27-4152 | FXD C FILM 150kΩ 5% 1/4W | |
| R206 | 40-27-2222 | FXD C FILM 2.2kΩ 5% 1/4W | |

| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| R207 | 40-27-3122 | FXD C FILM 12kΩ 5% 1/4W | |
| R208 | 45-38-2500 | VAR C COMP 5kΩ-B | HDK VZ103KTH1 5kΩ |
| R209 | 40-27-3222 | FXD C FILM 22kΩ 5% 1/4W | |
| R210 | 43-58-0290 | FXD W W 1.2Ω 10% 2W | |
| R211 | 43-58-0290 | FXD W W 1.2Ω 10% 2W | |
| R212 | 43-58-0290 | FXD W W 1.2Ω 10% 2W | |
| R213 | 43-58-0290 | FXD W W 1.2Ω 10% 2W | |
| R214 | 43-58-0290 | FXD W W 1.2Ω 10% 2W | |
| R215 | 43-58-0290 | FXD W W 1.2Ω 10% 2W | |
| R216 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R217 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R218 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R219 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R220 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| R221 | 40-27-0102 | FXD C FILM 10Ω 5% 1/4W | |
| CHASSIS MOUNTED PARTS | | | |
| C1 | 50-76-2510 | FXD PLSTC 0.1μF AC 250V | |
| C2 | 54-00-0304 | FXD ELECT 4.7μF 50V | |
| C3 | 54-01-0311 | FXD ELECT 10μF 50V | |
| C4 | 54-01-0324 | FXD ELECT 470μF 50V | |
| C5 | 50-67-0060 | FXD PLSTC 0.1μF 10% 100V | |
| CR1 | 32-90-1640 | DIODE BRIDGE | SHINDENGEN S10VB10 |
| CR2 | 37-00-0150 | LED GREEN | SHARP GL-4PG2 |
| CR3 | - | NOT USED IN THIS MODEL | |
| F1 | 99-02-0105 | FUSE 4A | |
| M1 | 70-20-0132 | METER 32V/DC | KIKUSUI S780936 |
| M2 | 70-20-0232 | METER 3.2A/DC | KIKUSUI S780941 |
| Q1 | 30-40-5261 | TR NPN | TOSHIBA 2SD526-Y |
| Q2 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-O |
| Q3 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-O |
| Q4 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-O |
| Q5 | 30-40-7181 | TR NPN | TOSHIBA 2SD718-O |
| Q6 | 30-47-7181 | TR NPN | TOSHIBA 2SD718-O |
| Q7 | 30-47-7181 | TR NPN | TOSHIBA 2SD718-O |
| R1 | 45-13-2101 | VAR C COMP 1kΩ-B | NOBLE RV24YN20S |
| R2 | 47-13-3101 | VAR W W 10kΩ-B | NOBLE RA25YN20S |
| R3 | 47-12-1500 | VAR W W 500Ω-B | NOBLE RA20YN20S |
| S1 | 82-42-0000 | SW SLIDE (POWER) | |
| S2 | 82-42-0000 | SW SLIDE (M-S) | |
| T1 | 60-45-0040 | P.T PAB 32-3 | KIKUSUI S790046 |

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| REFERENCE DESIGNATOR | KIKUSUI PARTS NO. | DESCRIPTION | |
|---|---|---|---|
| MISCELLANEOUS | | | |
| OUTPUT TERMINALS | | | |
| | N6-000-081 | BINDING POST (TRIPLE) | |
| | N6-000-041 | KNOB RED FOR BINDING POST | |
| | N6-000-061 | KNOB WHITE FOR BINDING POST | |
| KNOB | | | |
| | N1-000-011 | KNOB FOR VOLTAGE FINE | KIKUSUI R12SB |
| | N1-000-072 | KNOB FOR VOLTAGE COARSE AND CURRENT | KIKUSUI R18SB-N |
| SHORT BAR | | | |
| | E3-000-071 | SHORT BAR (BINDING POST) | |

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# WARRANTY

All instruments manufactured by KIKUSUI ELECTRONICS CORP. are warranted against defects in materials and workmanship for a period of two years from the date of original shipment from the factory. However, this warranty excludes batteries, lead wires and probes, and CRT's are warranted only for a period of one year from the date of original shipment from the factory.

In the event of any defects in materials or workmanship, KIKUSUI ELECTRONICS CORP. will, at its sole option, repair or replace the defective instrument covered by this warranty without charge. To obtain warranty service, the defective instrument must be returned within thirty (30) days of the expiration of the applicable warranty period to KIKUSUI INTERNATIONAL CORP. properly packaged and with transportation and insurance prepaid. We will reship at our expense only to destinations in the United States.

Any defect in materials or workmanship determined by KIKUSUI INTERNATIONAL CORP. to be attributable to customer alteration, modification, negligence or misuse is not covered by this warranty.

EXCEPT AS SET FORTH ABOVE, KIKUSUI ELECTRONICS CORP. AND KIKUSUI INTERNATIONAL CORP. MAKE NO WARRANTIES EITHER EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INSTRUMENTS; AND SHALL NOT BE LIABLE OR RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Kikusui International Corp.

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